

Contribution to the Marine Chlorophyta of Hawaii, II Additional Records¹

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THE ANNOTATED LIST which follows is comprised mostly of new or previously unreported marine green algae from the Hawaiian Islands. Sources of material studied are listed in an earlier paper (Gilbert, 1962) with the exception of a few incidental collections forwarded to me during recent months by Dr. Maxwell S. Doty.

This nearly completes a survey of the marine Chlorophyta of this area which was initiated in 1959 by a four-month visit to the islands. The writer has still some material that is not named, particularly of *Enteromorpha* and *Cladophora*, and only species in these genera are listed for which there seems to be reasonable certainty at this time.

The following species constitute new records for the Hawaiian Islands: *Enteromorpha clathrata* (Roth) Greville, *E. plumosa* Kützing, *Monostroma oxyspermum* (Kützing) Doty, *Ulva expansa* (Setchell) Setchell and Gardner, *U. reticulata* f. *delicatula* n. f., *Chaetomorpha brachygonia* Harvey, *C. gracilis* Kützing, *C. indica* Kützing, *C. paucitatis* n. sp., *Rhizoclonium grande* Børgesen, *R. bookeri* Kützing, *R. riparium* (Roth) Harvey, *Cladophora dotyana* n. sp., *C. hemisphaerica* Gardner, *Boodleopsis hawaiiensis* n. sp., *Codium saccatum* Okamura.

Type material is deposited at the University of Michigan Herbarium, Ann Arbor.

1. *Enteromorpha clathrata* (Roth) Greville, 1830, p. 181.

In both collections the plants are slender throughout and have many narrow branches some of which end in a uniseriate row of cells. The arrangement of cells in longitudinal rows throughout the plants and the presence of 3-5

pyrenoids in each cell confirm the plants as being *E. clathrata*.

COLLECTIONS: *Gilbert* 9379, entangled on other algae, Ala Moana Park, Honolulu, Oahu, April 7, 1959; 9969, in wash of little bay at Milolii, Hawaii, May 30, 1959.

2. *Enteromorpha flexuosa* (Wulfen) J. Agardh, 1883, p. 126.

COLLECTIONS: *Gilbert* 9016, Waikiki, Honolulu, Oahu, March 11, 1959; 9286, ½ mile E of McGregor's Pt., Maui, March 25, 1959; 9542, growing on basalt near high tide line, Wailua, Kauai, April 25, 1959; 9576, attached to rocks in active sand in from 1-3 feet of water at low tide level, Anahola, Kauai, April 26, 1959; 9922, from rocks which were slightly covered with sand, submerged at high tide, and frequently washed by wave action at low tide, Hookena, Hawaii, May 25, 1959; 10061, from rocks on shore between low and high tide levels, between Kawela and Kamaloo, Molokai, June 5, 1959.

3. *Enteromorpha intestinalis* (L.) Link, 1820, p. 5.

COLLECTIONS: *Gilbert* 9175, Camp 1, Sprecklesville, Maui, March 23, 1959; 9382, canal at River St., near Nimitz Highway, Honolulu, Oahu, April 7, 1959.

4. *Enteromorpha lingulata* J. Agardh, 1883, p. 143.

COLLECTION: *Gilbert* 9507, attached to rocks covered with a shallow layer of active sand, Haleiwa Park, Oahu, April 18, 1959; 9729, on basalt and coral rocks, Anahola, Kauai, May 2, 1959.

5. *Enteromorpha plumosa* Kützing, 1843, p. 300, pl. 20, fig. 1.

COLLECTION: *Gilbert* 9027, scraped from walls of tide pool filled with recurring waves, Diamond Head, Oahu, March 14, 1959.

¹ Albion College, Albion, Michigan. This study was supported by two grants from the National Science Foundation (NSF G7107 and NSF G25137). Manuscript received May 8, 1963.

6. *Enteromorpha ?tubulosa* Kützing, 1856. Tab. Phyc. VI, p. 11, pl. 32, fig. 2.

The following collection is assigned to this species with considerable uncertainty, especially since the cells appear to have 1–3 pyrenoids instead of but one as usually noted in the literature.

COLLECTION: *Gilbert 9705*, attached to clay tile at Kauai Boat Club between Kekaha and Waimea, Kauai, April 30, 1959.

7. *Monostroma oxyspermum* (Kützing) Doty, 1947, p. 12.

All of the collections listed below appear to be one species. Surface views and cross section studies were made. The average cell diameter is almost the same (about 9 μ) in all collections and the thalli (with the exception of *Gilbert 9377*) are all about 20–25 μ thick. Cells were grouped in twos, threes, and fours in surface view and all appeared somewhat taller than wide in cross sectional view, the thickness of the membrane external to the cells contributing mostly to the variation in thickness of the frond.

COLLECTIONS: *Gilbert 9377*, on cement wall at high tide level in canal, Ala Moana Park, Honolulu, Oahu, April 7, 1959; *9481*, wall of Natatorium, Waikiki, Honolulu, Oahu, April 15, 1959; *9785*, in quiet water around mangrove roots near docking area, Coconut Island, Kaneohe Bay, Oahu, May 14, 1959; *Meñez 722*, from basalt rocks covered with thin film of mud, above high tide line, in back of YWCA camp, Kaneohe Bay, Oahu, (no date); *Doty 17204*, highest tidal rocks in pool at Coconut Island, Hilo, Hawaii, Dec. 28, 1958; *Bernatowicz, A. J.* (no number), on stones where Kuliouou stream debouches into Maunalua Bay, Oahu, April 8, 1956.

8. *Ulva expansa* (Setchell) Setchell and Gardner, 1920, p. 284.

This relatively common *Ulva* is characterized by having broad unbranched thalli with ruffled margins and in having the thalli thicker in the middle than at the margins. Thalli of the Hawaiian material reach 30 cm in width and 43 cm in length, and range in thickness from 40–70 μ near the margin and from 75–100 μ in the center. Collections were made of attached

material from cement or rocks in the intertidal zone and of free-floating material in quiet tide pools.

COLLECTIONS: *Gilbert 9131*, Kahana, West Maui, March 22, 1959; *9520*, forming a distinct zone at high tide level on cement wall of pier running out from Natatorium-end of Kuhio Beach, Waikiki, Honolulu, Oahu, April 22, 1959; *9636*, in tide pool at Port Allen, Kauai, near Salt Pond Beach, April 27, 1959; *9933*, from tide pool at Honaunau, Hawaii, May 26, 1959; *9978*, from rocks, intertidal zone, 1.5 miles S of Kailua, Hawaii, May 31, 1959.

9. *Ulva fasciata* Delile, 1813, p. 153, pl. 58, fig. 5.

This is a common species, previously reported from Hawaii by several authors. It is extremely variable in form. Only a few of the collections studied are listed.

COLLECTIONS: *Gilbert 9218, 9219*, Hookipa Park, West Maui, March 24, 1959; *9356*, Hauula Park, Oahu, April 4, 1959; *9635*, low tide level in active surf, near Salt Pond, Port Allen, Kauai, April 28, 1959; *9709*, on rocks of breakwater, Nawiliwili Boat Harbor, Kauai, April 30, 1959; *9921*, in 1–3 feet of water, attached to rocks, Hookena, Hawaii, May 25, 1959; *10116*, rocks in quiet water, Mapalehu, Molokai, June 7, 1959.

10. *Ulva lactuca* Linnaeus, 1753, p. 1163.

COLLECTIONS: *Gilbert 9380*, in canal on River Street, near Nimitz Highway, Honolulu, Oahu, April 7, 1959; *9386*, on reef flat at Ala Moana Park, Honolulu, Oahu, April 8, 1959; *9548*, on reef at Wailua, Kauai, April 25, 1959; *10065*, attached to iron plates of tug boat, Kaulakakai, Molokai, June 6, 1959.

11. *Ulva reticulata* f. *delicatula* f. n.

Fig. 1

Frons non affixa, in algis aliis implicata, segmentis angustis reticulatisque, telis multis parvisque, frons ita delicata videtur; frons 32–36 μ crass, cellulae in duobus stratis, 7–13 μ diam a superficiei visae, a sectione transversa visae fere rotundae, in matrice gelatinosa laxae dispositae.

Gilbert 9947, TYPUS, e loco Kahaluu Park ad Kailua, Hawaii dicto, m. May 26, 1959 lectus.

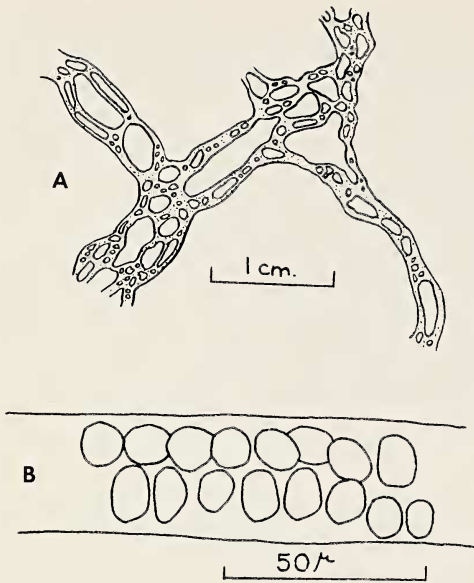


FIG. 1. *Ulva reticulata* f. *delicatula* f. n. A, Habit sketch of small portion of frond; B, transverse section of frond showing cell outlines.

Frond entangled in other algae, apparently unattached, its segments narrow and reticulate, the meshes numerous and small, thus giving the frond a delicate appearance; frond 32–36 μ thick, cells in two layers, 7 (10–11)–13 μ diam in surface view, nearly round in cross sectional view, loosely arranged in the gelatinous matrix.

COLLECTION: *Gilbert* 9947, TYPE, Kahaluu Park, S of Kailua, Hawaii, May 26, 1959.

This collection was first reported by the writer (1962:143) as *Ulva reticulata* Forsskål (1775:187) but later study suggested it is sufficiently different to be regarded as a form of that species. It differs from forma *reticulata* in its much more delicate appearance resulting from the extremely fine meshes, in the fact that the frond is thinner (32–36 μ, as compared with the usual 50–76 μ), and in that the cells are less closely arranged and at most only slightly elongated when viewed in a cross section of the frond.

12. *Ulva rigida* C. Agardh, 1822, p. 410.

The following collection is assigned with some uncertainty to this species. Only two fronds were found in a large mound of algae washed up on the beach by wind and wave action. One frond was a very dark green and

both were relatively stiff and leathery, certainly different to the touch from other *Ulva* in the pile. The two fronds are ovate, about 11 cm in length with a distinct but very short petiole. The fronds reach 137 μ in thickness. When seen in a cross section of the frond the cells are vertically elongated, up to 4 times their width in length, and the gelatinous matrix between and external to the cell layers is wide.

COLLECTION: *Gilbert* 9188, in wash at Naska, Maui, March 23, 1959.

13. *Chaetomorpha antennina* (Bory) Kützing, 1849, p. 379.

This species commonly occurs where exposed to surf and actively moving water as in spillways. Rather large quantities of material have been examined with particular reference to the basal cell and considerable variation in basal cell size and degree of annulation have been noted. For example, in plants which appear to belong to the same clone (of *Gilbert* 9761) there are a few apparently mature plants with basal cells having no annulations, but in most plants the annulations are distinct and numerous. This species has been reported previously by several authors and only representative collections of my own are reported.

COLLECTIONS: *Gilbert* 9141, Kalama Park, Maui, March 23, 1959; 9417, near Kahe Point, Oahu, April 11, 1959; 9761, base of Na Pali Cliffs, near Mana, Kauai, May 3, 1959; 9839, Onekahakaha Beach, Hilo, Hawaii, May 22, 1959; 10079, ca. 3 miles N of Wailua, Molokai, June 6, 1959.

14. *Chaetomorpha paucitatis* sp. n.

Fig. 2

Plantae non crebrae, dilute virides, 4.5–5 cm alt., metallicae rigidaeque, parte in inferiore laxae 2–3 convolutae, in penicillis 2–5 plantarum singularum; cellulae basales 200–700 μ long., 57–130 μ lat., longioribus a crescentia rhizoideorum secundariurum, quae e cellulis supra in cellulam basalem primariam, hapteron discoidium habentem, descendunt, orientibus; cellulae in filamento inferiore 150–190 μ diam, ad septa interdum constrictae supra maiora (ad 500 μ) factae, et per formationem zoosporarum inflatae; membrana cellularum striata, crassitudine vari-

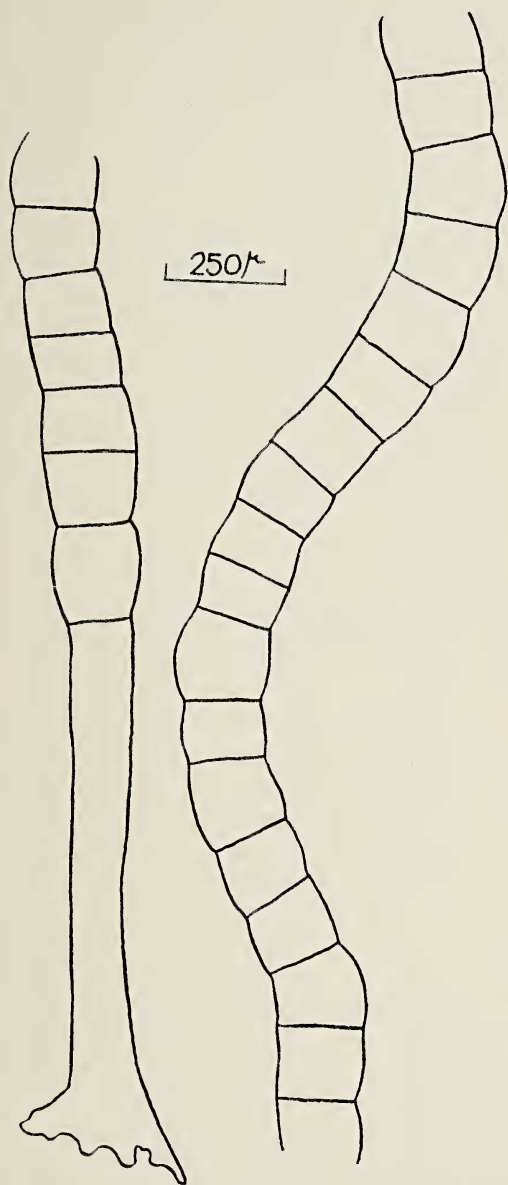


FIG. 2. *Chaetomorpha paucitatis* sp. n. Basal cell and portion of the filament immediately above a basal cell showing one of the spirals.

ans, in cellulis basalibus usque ad 18 μ , in cellulis aliis usque ad 14 μ .

Gilbert 9521, TYPUS, in superficie horizontali massarum "concreti" in aqua non profunda e loco Kuhio Beach, Waikiki, Honolulu, Oahu dicto, m. April 22, 1959 lectus.

Plants uncrowded, light green, 4.5–5 cm tall, in tufts of 2–5, wiry and stiff to touch, laxly spiralled 2–3 times in lower part; basal cells 200–700 μ long, 57–130 μ wide, the longer ones derived from the growth of secondary rhizoids into the primary basal cell which has a disk-like holdfast; cells in lower filament 150–190 μ diam, occasionally constricted at septa, becoming larger above (to 500 μ) and inflated during zoospore formation; cell walls striated, thickness variable, up to 18 μ in basal cells and to 14 μ in other cells.

COLLECTIONS: *Gilbert 9521*, TYPE, growing on horizontal surface of cement blocks in shallow water, Kuhio Beach, Waikiki, Honolulu, Hawaii, April 22, 1959; 9799, same location, May 16, 1959.

The plants described here as new are most suggestive of *Chaetomorpha aerea* (Dillwyn) Kützing, differing from that species in its lighter color and in the fact that only a few plants arise in a tuft instead of being strongly gregarious.

15. *Chaetomorpha brachygona* Harvey, 1858, Ner. Bor.-Amer., pt. 3, p. 87, pl. 46A, fig. 1, 2.

COLLECTIONS: *Gilbert 9927*, from muddy water, 1–3 feet below surface in a little bay, Honaunau, Hawaii, May 26, 1959; *Doty 12383A* (in part), washed in at beach laboratory, Waikiki, Honolulu, Oahu, Feb. 6, 1958.

16. *Chaetomorpha gracilis* Kützing, 1845, p. 203.

COLLECTIONS: *Doty 12440*, in large soft "pillow" on very fine sand on bottom of hole in reef (–4 ft) at Hanauma Bay, Oahu, April 6, 1954; 12650, forming skein of relatively untangled filaments over a "room-size" area in Waikiki Natatorium in about 10 ft of water on sandy mud bottom, Waikiki, Honolulu, Oahu, Sept. 25, 1954.

17. *Chaetomorpha indica* Kützing (prox.), 1849, p. 376.

Assignment of the collections below to *C. indica* is made with considerable uncertainty.

COLLECTIONS: *Gilbert 9348, 9349*, entangled on other algae, two to four feet below the surface, Hauula Park, Oahu, April 2, 1959.

18. *Rhizoclonium grande* Børgesen, 1935, p. 14, figs. 5-6.

Fig. 4, E

This large *Rhizoclonium* was found growing most frequently on flat rock surfaces and nearly covered with a thin layer of sand which was probably trapped by the interwoven filaments. Filaments of the Hawaiian material range from 225-400 μ in diameter, with the cells from three-fourths to three diameters long. I have compared the Hawaiian plants with those of a collection from Mauritius (*Morin 1151*) identified by Børgesen as *R. grande* and found the plants in both collections to agree closely.

COLLECTIONS: *Gilbert 9509*, abundant on rock flats especially where covered with thin layer of sand, Kaena Pt., Oahu, April 18, 1959; *9660*, Anahola Beach, Kauai, April 29, 1959; *9945*, on rocks covered with thin layer of sand, Kahaluu Park, Hawaii, May 26, 1959; *10003*, Honaunau Beach, Hawaii, June 1, 1959.

19. *Rhizoclonium hookeri* Kützinger, 1849, p. 383.

COLLECTIONS: *Doty 13291*, present in gas holes and small cracks of solid rock about 2.5 ft above high tide line at 115 East Banyan Drive, Hilo, Hawaii, Aug. 16, 1956; *Setchell 5220*, Coconut Island, Hilo, Hawaii, July 14, 1900*.

20. *Rhizoclonium riparium* (Roth) Harvey, 1849, p. 238.

COLLECTIONS: *Gilbert 9962*, in wading pool on Coconut Island, Hilo, Hawaii, May 27, 1959; *Doty 8671*, large mass stuck in a coral head, Hauula Bay, Oahu, Feb. 24, 1951; *8248*, near mouth of Manini Gulch, Kauna, Oahu, Oct. 21, 1950.

21. *Cladophora dotyana* sp. n.²

Fig. 3

Plantae sparsae aut in tegetibus gregariae,

² Since this manuscript was accepted for publication *Cladophora patula* Sakai has been described as new and appears to be the same species (pp. 22-25 of Y. Sakai, 1964). The species of *Cladophora* from Japan and its vicinity, Scientific Papers of the Institute of Algological Research, Faculty of Science, Hokkaido University 5 (1):1-104, 17 pls.

fusco-virides, 2-4 cm alt., rudes rigidaeque, per extensiones rhizoidales 2-4 cellularum infimarum relative brevium affixae; cellulae admodum super basales 3.5-12 mm long., ad 600 μ lat., ad extremitates distales 3-4 (raro 5) ramos efficientes, ramis saepe late divaricatis ad retrorsos, interdum contortis, ex una cellula sola ad hanc altitudinem plerumque constantibus, ramificatio supra plerumque di-trichotoma, ramis multis erectisque, cellulis, ut filamenta fruticulosa velut per ventum deflexa videantur, saepe in eadam directione curvatis, cellulis 1.2-4 diam long., 210-300 μ lat., septis inter ramos crebris, cacumina ramorum obtusa; cellulae per plantam cylindricae, non inflatae, membranis striatis, in cellulis inferioribus 25 μ (15-37 μ) crass, in cellulis superioribus 12 μ (7.2-18 μ) crass.

Gilbert 9214, TYPUS, in superficie inferiore rupis lacui minuente aestu imminens, in loco Hookipa Park, East Maui dicto, m. March 24, 1959 lectus.

Plants sparse or in gregarious mats, dark green, 2-4 cm high, coarse and stiff, attached by rhizoidal extensions of the 2-4 lowermost relatively short cells; cells immediately above the basal cells 3.5-12 mm long to 600 μ wide, giving rise to 3-4 (rarely 5) branches at their distal ends, the branches frequently widely divaricate to retrorse, at times contorted, and usually consisting of but one cell at this level; above branching usually di-trichotomous, numerous, the branches erect with cells often curving in one direction to give a wind-blown appearance to the tufted filaments, the cells 1.2-4 diameters long, 210-300 μ wide, with septa frequent between branches; branch tips obtuse-rounded; cells cylindrical throughout the plant, not inflated, their walls striated, 26 μ (15-37 μ) thick in lower cells, 12 μ (7.2-18 μ) in upper cells.

COLLECTION: *Gilbert 9214*, TYPE, on the under surface of a rocky overhang in tide pool, Hookipa Park, East Maui, Hawaiian Islands, March 24, 1959.

This unusual and distinctive *Cladophora* bears little resemblance to other robust species. It is characterized by its short stature,

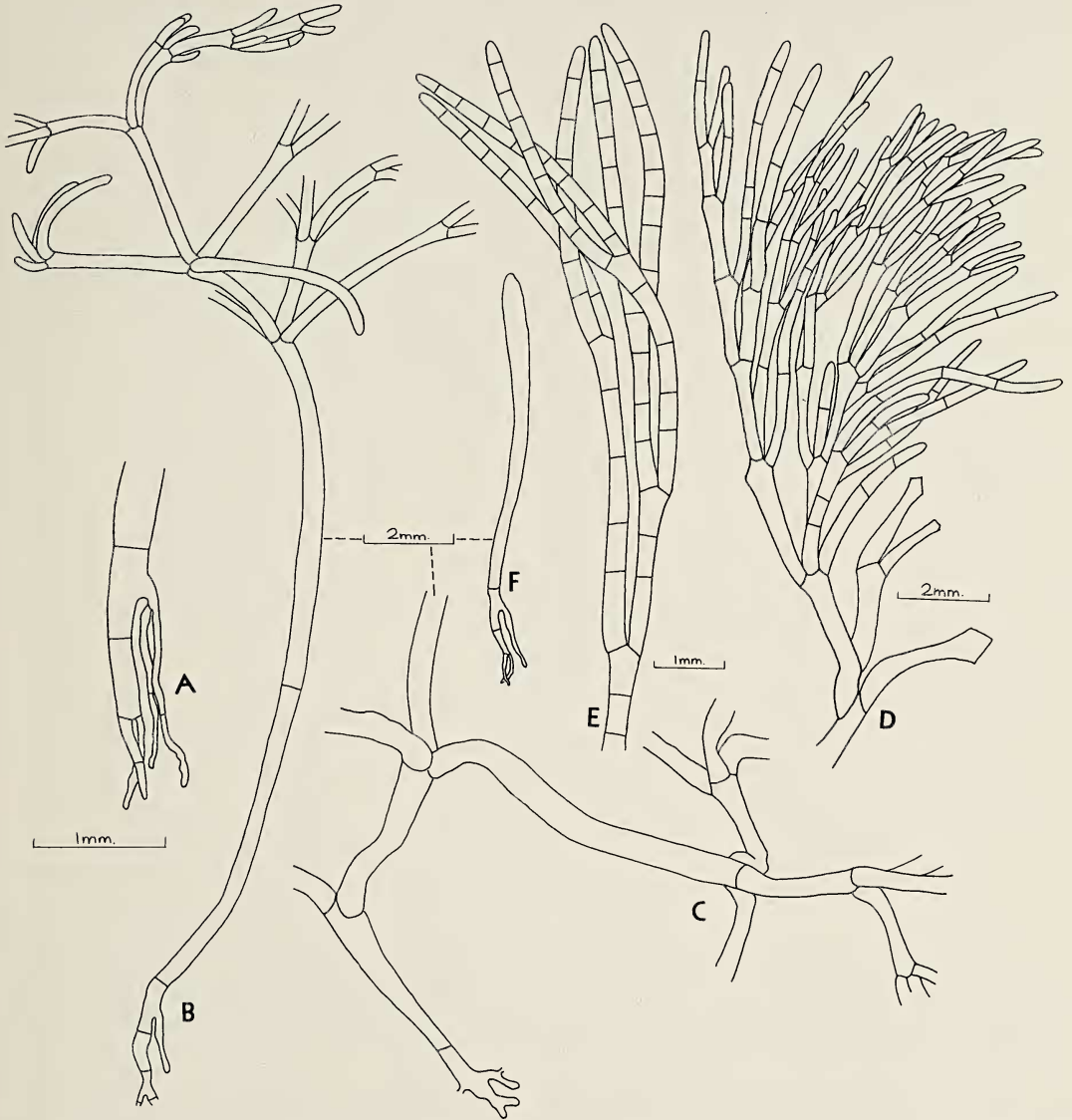


FIG. 3. *Cladophora dotyana* sp. n. A, Basal cells; B, a nearly complete young plant; C, portion of the lower part of a mature plant; D, E, terminal portions of a mature plant; F, a very young plant.

wind-blown appearance, large diameter stiff filaments, extremely long primary cells, and frequent widely divaricate to retrorse condition of the primary branches. None of the plants in several collections has exceeded 4 cm in height even though growth appeared to be luxurious. It differs from *C. fuliginosa* Kützing in that branching in *C. dotyana* is often tri- or quadrichotomous in the lower two-thirds of

the plant, the upper cells are not strongly arcuate, and the tip cells are relatively much shorter for their diameter than in the former species. Perhaps *C. dotyana* most closely resembles *C. prolifera* (Roth) Kützing and *C. pellucida* (Huds.) Kützing. *C. dotyana* is much shorter, more closely branched, and lacks the fasciculate grouping of the ultimate branchlets of *C. pellucida*. Furthermore, the proposed species does

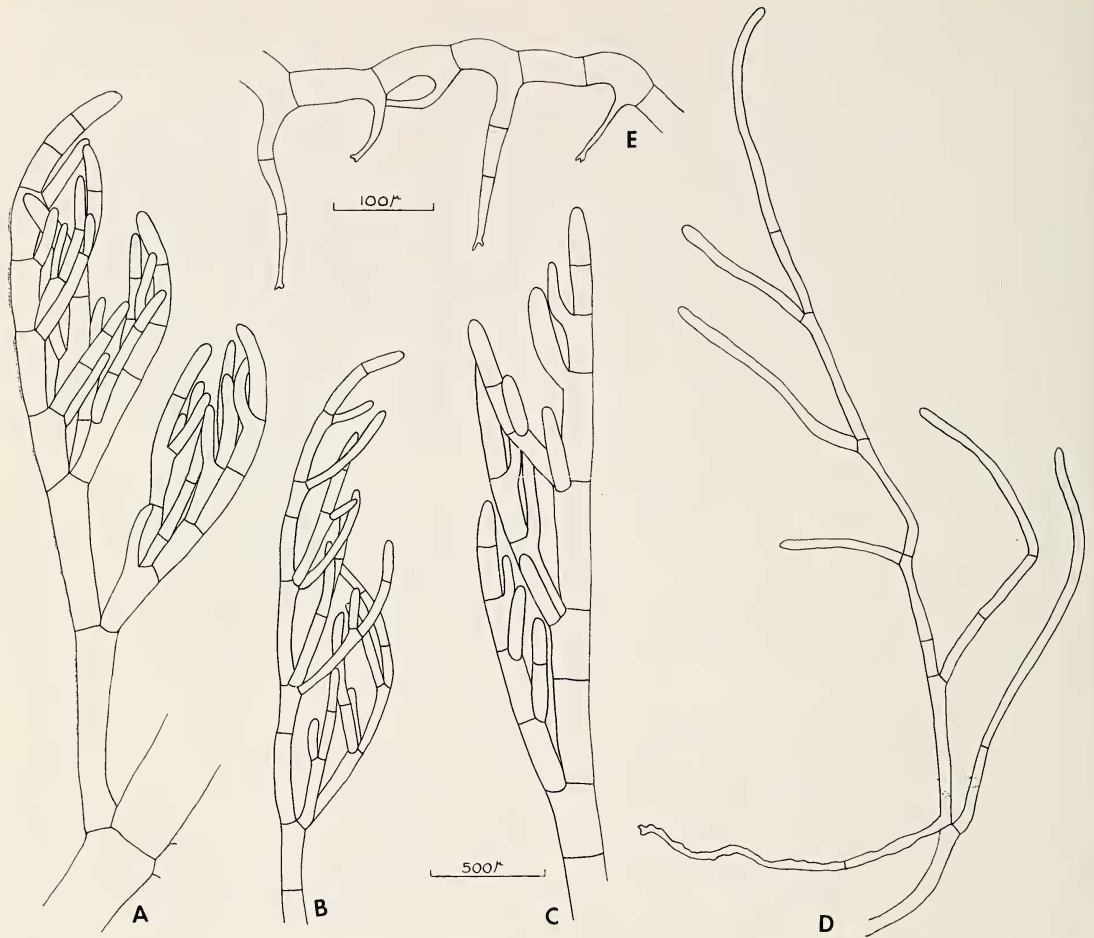


FIG. 4. A, B, *Cladophora inserta* f. *ungulata* (Brand) Setchell. A, Terminal cluster of branches in the size-range of *C. fascicularis*; B, terminal branch cluster of *C. inserta* f. *ungulata* of usual size range; C, *C. fascicularis* (Mertens) Kützing, terminal branch cluster; D, *C. socialis* var. *hawaiiiana* Brand, habit sketch; E, *Rhizoclonium grande* Børgesen, short section of a filament.

not have the unusually long lower cells so characteristic of *C. pellucida*. It can be separated from *C. prolifera* by the fact that all branches of *C. prolifera* seem to be erect, showing no tendency toward the widely divergent to retrorse branching in the lower part of the frond of *C. dotyana*. *C. radiosa* (Suhr) Kützing, *C. wrightiana* Harvey, and *C. valonioides* Sonder are three additional species having wide diameter filaments, but none of these bears resemblance to *C. dotyana*.

It is of interest to note that in the Herbarium of the University of California there are three collections of this proposed species which were

made in Hawaii. All three collections were made in the early part of the century by Miss Minnie Reed and are filed under the name of *Cladophora valonioides* Sonder. These specimens bear Miss Reed's numbers 149, 386, and 1160, and the collections were made on Maui, Kauai, and Oahu, respectively.

OTHER COLLECTIONS: Gilbert 9036, in crevice at end of Laie Pt., Oahu, March 17, 1959; 9046, at low tide level in crevices and occasionally on exposed surfaces in basalt dike, Hanauma Bay, Oahu, March 19, 1959; 9228, between Hookipa Park and Paia, Maui, March 24, 1959; 9818, Kapaa Park, near Mahukona Har-

bor, Hawaii, May 21, 1959; 9991, Palemano Pt., at S end of Kealakekua Bay, Hawaii, June 1, 1959; 10128, ca. 3 miles NE of Wailua, Molokai, June 7, 1959.

22. *Cladophora fascicularis* (Mertens) Kützing, 1843, p. 268.

This species is relatively common and is frequently found attached or free-floating in the wash along the shore. In its typical form (Fig. 4, C) it is easily distinguishable from *C. inserta* f. *ungulata* (Brand) Setchell, but there are many intermediates to suggest that the two species may be the same, as suggested by Børgesen (1948:8) who still listed them separately. Certainly the extremes are readily recognizable.

COLLECTIONS: *Gilbert* 9126, Kahana, Maui, March 22, 1959; 9171, Camp 1, Sprecklesville, Maui, March 23, 1959; 9189, Naska, Maui, March 23, 1959; 9297, Maalaea Boat Harbor, Maui, March 25, 1959; 9708, Nawiliwili Boat Harbor, Kauai, April 30, 1959.

23. *Cladophora hemisphaerica* Gardner, in Collins, Holden, and Setchell, Phyc. Bor.-Amer. (Exsicc.), no. 2240 (nomen nudum), in Collins, F. S., 1918, p. 83 (descr.).

These plants rather closely follow Gardner's description. They were more or less crowded on a horizontal rock surface and appear as dense, hemispherical, dark green tufts, 1–2 cm in diameter. The lower branches have cells to 65–70 μ diam, 1–3 diam long, and the branches are widely divergent. Branchlets in outer part of the thallus have cells to 45–70 μ diam, with the branches less divergent.

COLLECTION: *Gilbert* 9946, on horizontal rock surface washed by waves, Kahaluu Park, Hawaii, May 26, 1959.

24. *Cladophora inserta* f. *ungulata* (Brand) Setchell, 1926, p. 75, pl. 22.

In its typical form (Fig. 4, B) this plant is easily separated from *C. fascicularis* on the basis of the much smaller diameter of the ultimate segments and the characteristic curving of the terminal branchlets. Figure 4, A was drawn from a collection containing plants which, while maintaining the curved aspect of the terminal branchlets, are as large as *C. fascicularis*.

Hawaii is the type locality for this form of *C. inserta*. It was first described by Brand (1905, p. 180, pl. 5, figs. 10, 11) as *C. mauritiana* var. *ungulata* from material collected by Tilden.

COLLECTIONS: *Gilbert* 9010, between Elks' Club and Natatorium, Waikiki, Honolulu, Oahu, March 11, 1959; 9022, in wash, Waikiki, Honolulu, Oahu, March 14, 1959; 9148 and 9149, Kalama Park, Maui, March 23, 1959; 9373, in shallow water, near shore, near Laie Pt., Oahu, April 4, 1959; 9479, on Natatorium wall, Waikiki, Honolulu, Oahu, April 15, 1959.

25. *Cladophora socialis* var. *hawaiiiana* Brand, 1905, p. 182.

This species (Fig. 4, D) is common in warm, shallow tide pools as soft, oval, greyish-green, spongy masses. It is a species having wide distribution.

COLLECTIONS: *Gilbert* 9052, on sides of tide pools on bench of old lava flow where washed by high waves, Hanauma Bay, Oahu, March 19, 1959; 9230, between Hookipa Park and Paia, Maui, March 24, 1959; 9535, from tide pool at Spouting Horn, Kauai, April 24, 1959; 9741, from pools in basalt rock at Poipu Beach Park, Kauai, May 2, 1959; 9815, from tide pools in lava, Kapaa Park, Hawaii, May 21, 1959; 10083, 3 miles NE of Wailua, Molokai, June 6, 1959.

26. *Boodleopsis hawaiiensis* sp. n.

Fig. 5

Planta parva siphonacea viridis, pulvillos coarctos in rimis umbrosis fossarum lavae 7–10 metra super aquae altitudinem aestu alto efficiens; filamenta inferiora (obtecta) aliquantulum laxa, (plerumque) dichotome ramosa, sine constrictionibus ad bases ramorum, pauciores chloroplastos quam in parte plantae superiore habentia, diametro varians, ab 11–60 μ , membranibus crassitudine variantibus, saepe striatis; nonnulli rami inferiores descendentes, satis tenues, fere sine colore, aspectu rhizoidei facti, rami rhizoidei, autem, ubilibet in planta saepe reperti; filamenta superiora diametro uniformiora, 16–23 (30) μ lat., chloroplastis parvis rotundis ad ovatos, ut videtur sine pyrenoidis, conferte impleta, ramificatio dichotoma ad manifeste lateralem, constrictionibus ad bases ramorum manifestis; constrictiones secundaria inter ramos sparsae aut nullae.

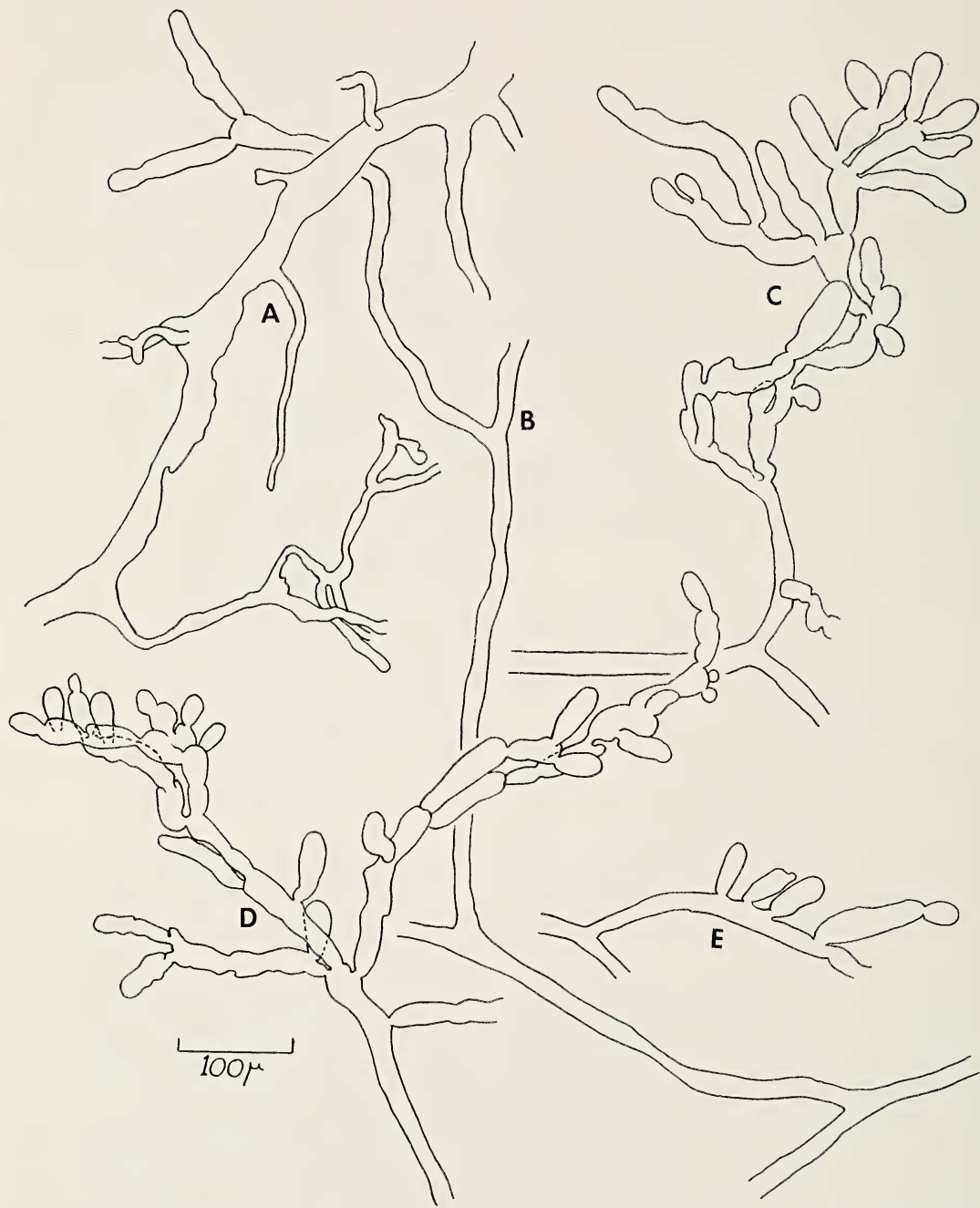


FIG. 5. *Boodleopsis hawaiiensis* sp. n. A, Portion of lower covered filaments; B, appearance of other lower filaments with remote dichotomies lacking constrictions (there is a terminal or upper part to this figure which shows a dichotomy with constrictions); D, E, upper branchlets showing lateral to di-trichotomous branching and the constrictions which are largely confined to branch bases just above the dichotomies.

Doty 19255, TYPUS, super fossam lavae prae-historicam 6–8 metra super arenam atque aquae altitudinem aestu alto, ca. 17 metra versus orientem fluminis lavae 1955 Keekee in loco Puna, Hawaii dicto, m. Dec. 23, 1959 lectus.

Plant small and siphonous, green, forming felted cushions on sand in shaded crevices of lava dikes 20–30 ft above high tide line; lower (covered) filaments somewhat lax, (usually) dichotomously branched with no constrictions at branch bases, and with fewer chloroplasts than in upper part of plant, diameter variable, from 11–60 μ and with walls of variable thickness and often striated; some of lower branches descending, becoming quite slender, almost colorless, and rhizoidal in appearance, but rhizoidal branches may, and often do, occur at almost any part of the plant; upper filaments more uniform in diameter, 16–25 (30) μ , crowded with small round to oval chloroplasts that are apparently without pyrenoids, branching di-trichotomous to distinctly lateral with constrictions evident at branch bases; secondary constrictions between branches infrequent to absent.

COLLECTIONS: *Doty 19255*, TYPE, on top of prehistoric lava dike, 6–8 meters above the sand and high tide line, about 50 ft E of the 1955 Keekee lava flow, Puna, Hawaii, Dec. 23, 1959; *19355*, growing in shaded crevices about 20–30 ft above high tide line about $\frac{1}{4}$ mile E of the 1955 lava flow in Keekee, Puna, Hawaii, Sept. 8, 1960.

After a prolonged study I have come to the conclusion that the material represents an undescribed species of *Boodleopsis*, which itself is a rather uncertain genus³ in the Siphonales.

Boodleopsis was established by A. and E. S. Gepp (1911:64) who named and described *Boodleopsis siphonacea*. Subsequently two species have been added to the genus, *B. pusilla* (Collins) Taylor, Joly, and Bernatowicz (by transfer from *Dichotomosiphon*) and *B. verticillata* Dawson (1960:32). The proposed species differs from *B. siphonacea* and *B. pusilla* in its smaller size, the fact that it lacks the secondary constrictions between the branches of its upper filaments, and in that it frequently

branches laterally, sometimes to the exclusion of di- or trichotomous branching. *B. hawaiiensis* differs from *B. verticillata* in its distinctly smaller size and the lack of verticillate branching. Attention should also be called to the fact that all three of the previously described species are known from a muddy substratum on reefs or in estuaries, while *B. hawaiiensis* was found on a sandy substratum in shaded crevices of a lava dike 20–30 ft above high tide line.

27. *Codium saccatum* Okamura, 1915, p. 145, pl. 135, figs. 1–5.

A single specimen of this species was included in a small assortment of algae collected from the wash at Midway Island by Dr. Hubert Frings and sent to me by Dr. Doty. This *Codium* is characterized by its thin, tough, membranous sac-like form and its very small utricles. It has been reported rarely outside of Japan (Dawson, 1957:107).⁴ Although Midway Island is not included officially within the State of Hawaii, geographically it is part of the archipelago and hence the basis for including *C. saccatum* in this list.

COLLECTION: *Doty 19699*, in wash, Midway Island, April, 1962, collected by Dr. Hubert Frings.

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³ See the discussion in Taylor, Joly, and Bernatowicz (1953:103–105).

⁴ In personal correspondence Dr. Paul Silva reports that this species has appeared also from Tonga Island, in collection No. 13206 of the Capricorn Expedition.

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